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| 10/527,993 | 10/17/2005 | Satish Gunturi | 004501-807 | 4890 |

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| EXAMINER | |
|---|---|
| DICKEY, THOMAS L | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2826 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 04/24/2008 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ADIPFDD@bipc.com

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/527,993 | GUNTURI ET AL. | |
| | Examiner | Art Unit | |
| | Thomas L. Dickey | 2826 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *03 March 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-9* is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**/Thomas L. Dickey/**
**Primary Examiner**
**Art Unit 2826**

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 March 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☒ All b)☐ Some * c)☐ None of:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

**1.** The amendment filed on 03/03/2008 has been entered.

### *Information Disclosure Statement*

**2.** The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the examiner has cited the references Applicants have incorporated into the specification on a form PTO-892, they have not been considered. Applicant may rely on the attached form PTO-892 for assurance that Lang et al. 6,426,561 has been considered.

### *Claim Rejections - 35 USC § 103*

**3.** The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

**A.** Claims 1-3,8, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over LANG ET AL. (6,426,561) in view of TSURUOKA (4,403,242) and KOGO ET AL. (5,437,921, as cited by Applicants on 10/17/2005).

Lang et al. discloses a high-power press pack semiconductor module comprising electrically conducting base and top plates (not shown in the figures. At column 2 lines 50-59 Lang et al. describe their electrically conducting base and top plates as "Further foils or wafers... not shown in FIG. 1 [with] thermal expansion [matched to] silicon [and] provided between the first main electrode 5 and the substrate 2 on the one hand, and between the second main electrode 6 and the contact piston 3, [and] produced, for example, from materials such as Mo, Cu, or Mo--Cu composites") a contact piston 3 in pressing contact with the top plate; at least one semiconductor chip 4 including silicon, a semiconductor material, a first main electrode 5 that makes contact with the base plate forming an interface and a second main electrode 6 that makes contact with the top plate, a first module power connection (shown in figure 1 without a part #. This part is seen in figure 1 as the part having the same relationship to Lang's contact piston 3 as part 11 in Applicant's figure 1 has to Applicant's contact piston 5) in pressing contact with the base plate; and a second module power connection (shown in figure 1 without a part #. This part is seen in figure 1 as the part having the same relationship to Lang's substrate 2 as part 12 in Applicant's figure 1 has to Applicant's part 4) in pressing

contact with the contact piston 3; wherein a material 7 is provided adjacent at least one of said first 5 or second 6 main electrodes that, together with the semiconductor material forms an eutectic alloy or an alloy whose melting point is below that of the semiconductor material, and wherein at least one of said base plate and top plate is made of a material (molybdenum) whose coefficient of thermal expansion is close to that of the semiconductor material (silicon). Note figure 1, column 2 lines 34-59, and column 3 lines 9-43 of Lang et al. Lang et al. does not disclose that said both said base plate and top plate are made of the same metal matrix composite material, said metal matrix composite material comprised of two-dimensional randomly distributed short cut graphite fibers in the interface in an Al or Ag matrix and said metal matrix composite material has a metal content of at least 25 percent by volume.

However, Tsuruoka discloses a high-power press pack semiconductor module, said high-power press pack semiconductor module comprising a housing 1-2-3-4 containing a base plate 106, top plate 111, and semiconductor chip 101, the base plate 106 and the top plate 111 both made of the same metal matrix composite material, said metal matrix composite material comprised of short cut graphite fibers in the plane of the interface in a Cu matrix. Note figures 1-3, column 4 lines 21-66, and column 6 lines 30-36 of Tsuruoka. Note (column 4 lines 61-63 and column 6 line 31) that, just like the

molybdenum top and base plates of Lang et al., Tsuruoka's top 111 and base 106 plates have CTEs that closely match that of the silicon chip 101.

When the substitution of one known element for another would have yielded results that were predictable to of ordinary skill in the art, the result of that substitution would have been obvious, within the meaning given that term by the statute. It has been held, for example, that the substitution of a continuous, two-ply seam for a folded seam, both being known to the art in question, is no more than the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for improvement, and therefore obvious. See *Ex parte* Smith, 83 USPQ2d 1509, 1518 (Bd. Pat. App. & Int. 2007, PRECEDENTIAL). See also KSR Int'l Co. v. Teleflex Inc., 127 S.Ct. 1727, 1740, 82 USPQ2d 1385, 1396 (2007) ("In United States v. Adams, … [t]he Court recognized that when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result.")

Tsuruoka teaches enough so that one of skill in the art would have expected to be able to successfully substitute the base top plates 106, 111, both made of the same metal matrix composite material, said metal matrix composite material comprised of short cut graphite fibers in the plane of the interface in a Cu matrix, for Lang et al.'s molybdenum base and top plates, with a predictable result. It would therefore have

been obvious to a person having skill in the art to modify Lang et al.'s semiconductor module by including the housing containing a base plate and top plate both made of the same metal matrix composite material, said metal matrix composite material comprised of short cut graphite fibers in the plane of the interface in a Cu matrix, as taught by Tsuruoka, thus achieving the claimed invention.

The short cut graphite fibers of Tsuruoka's Cu metal matrix composite material are not, however, randomly distributed in the plane of the interface of an Al or Ag matrix having a metal content of at least 25 percent by volume. Therefor the combination of Lang et al. and Tsuruoka does not suggest a semiconductor module having a metal matrix composite material that has these missing properties. However, Kogo et al. discloses an electronic component mounting base material comprising an aluminum alloy reinforced with graphite fibers with a volume fraction of about 15 per cent, the graphite fibers in the base material being short cut graphite fibers two-dimensionally randomly distributed in a plane of said Al alloy matrix. Note figure 2 and column 5 lines 26-58 of Kogo et al. Because the result would have been predictable, according to the evidence supplied by Kogo et al., it would have been obvious to a person having skill in the art to modify the semiconductor module suggested by Lang et al. and Tsuruoka by substituting for Tsuruoka's Cu metal matrix composite material the electronic component mounting base material comprising an aluminum alloy reinforced with

graphite fibers with a volume fraction ranging of about 15 per cent, the graphite fibers in the base material being short cut graphite fibers two-dimensionally randomly distributed in a plane of said Al alloy matrix, as taught by Kogo et al., thus achieving the claimed invention.

In a case such as this one, where "an improvement is no more than 'the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for improvement,' *KSR Int'l Co. v. Teleflex Inc.*, [127 S.Ct. 1727, 1740, 82 USPQ2d 1385, 1396 (2007)], no further analysis is required of the Examiner." See *Ex parte* Smith, 83 USPQ2d at 1518.

With specific regard to claims 8 and 9, Lang et al., Tsuruoka, and Kogo et al. suggest the claimed high-power press pack semiconductor module except for assuring that at least one of said base plate or top plate of a metal matrix composite material has a thickness of at least the thickness of the semiconductor material, said base plate and top plate therefor necessarily having a combined thickness of said at least the thickness of the semiconductor material. It would have been obvious to one of ordinary skill in the art at the time the invention was made to assure that at least one of said base plate or top plate of a metal matrix composite material has a thickness of at least the thickness of the semiconductor material, said base plate and top plate therefor necessarily having a combined thickness of said at least the thickness of the semiconductor material, since

it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. See *In re Aller*, 105 USPQ 233.

**B.** Claims 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over LANG ET AL. (6,426,561) in view of Tsuruoka (4,403,242) and Kogo et al. (5,437,921), as applied to claim 1, and further in view of Pepper et al. (3,770,488).

Lang et al., Tsuruoka, and Kogo et al. suggest a high-power press pack semiconductor module comprising all the limitations of claims 4-7 except that said metal matrix composite material comprises an Ag or Al metallic matrix alloy with a semiconductor material with a Si content of at most 13 percent, resulting in a semiconductor (Si) content limited to not more than the semiconductor material content of an eutectic composition. Note figure 1, column 2 lines 34-59, and column 3 lines 9-43 of Lang et al., figures 1-3, column 4 lines 21-66, and column 6 lines 30-36 of Tsuruoka, and figure 2 and column 5 lines 26-58 of Kogo et al.

However, Pepper et al. discloses metal-graphite fiber matrices composite comprising various "real-world" examples of metal matrix composite materials comprises an Ag or Al metallic matrix alloy with a semiconductor material with a Si content of at most 13 percent, resulting in (note that this result is guaranteed by the fact that, because claim 6 depends from claim 5, claim 5 reads on claim 6) content limited to not more than the

semiconductor material content of an eutectic composition. Note table I and examples 6-8 and 14-16 of Pepper et al. Note that, according to column 3 lines 35-41 of Pepper et al., "Molten aluminum, magnesium and their base alloys do not readily wet graphite at temperatures up to approximately 800 degrees... At temperatures in excess of 800 degrees [aluminum and magnesium] rapidly react with graphite to form aluminum or magnesium carbide ... lead[ing] to degradation of the mechanical properties of the graphite yarn."

The further limitations of applicant's claim 7 do not distinguish over the Pepper et al. reference regardless of the functions allegedly performed by the claimed device, because only the device per se is relevant, not the recited function of tailoring the semiconductor material content and thickness of the semiconductor material such that the hotspot alloy is in the eutectic range without bulk precipitation.

Note that functional language in a device claim is directed to the device per se, no matter which of the device's functions or properties is referred to in the claim. *Hewlett-Packard Co. v. Bausch* & Lomb Inc., 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) ("[A]pparatus claims cover what a device is, not what a device does" [emphasis in original]), makes it clear that it is the patentability of the device per se which must be determined in a "functional language" claim and not the patentability of the function, and that an old or obvious device alleged to perform a new function is not

patentable as a device, whether claimed in "functional language" terms or not. Note that caselaw makes clear that in such cases applicant has the burden of showing that a prior art device that appears reasonably capable of performing the allegedly novel function is in fact incapable of doing so. See In re King, 231 USPQ 136 (Fed. Cir, 1986) ("It did not suffice merely to assert that [the cited prior art] does not inherently achieve [the claimed function], challenging the PTO to prove the contrary by experiment or otherwise. The PTO is not equipped to perform such tasks") and In re Best, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977) (claiming a new use, new function or unknown property which is inherently present in the prior art does not necessarily make the claim patentable). See MPEP § 2114.

In *Ex parte* Smith, 83 USPQ2d at 1514, the Board found, "There is nothing in the Specification to indicate that the [property] necessary to render the [claimed structure] [capable of the clamed function] is anything more than the inherent result of constructing the [claimed structure] of standard materials in accordance with claim 35's other limitations, which are expressly disclosed in [the prior art]." The Board held, "We thus agree with the Examiner that a prima facie case of anticipation is established by [the prior art]. Because the Appellant presented no evidence to overcome the Examiner's finding of the inherent ability of [the prior art's] [structure] to [perform the clamed function], she failed to meet her burden to overcome that prima facie case. We

therefore find that claim 35 is anticipated by [the prior art]." The Board cited *In re King* for the proposition that "[A] prima facie case of anticipation [may be] based on inherency," and *In re Best* for the proposition that "Where, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product," in support if its holding. *Id.*

In this case it is reasonable to assume that Pepper et al.'s metal matrix composite material is capable of tailoring the semiconductor material content and thickness of the semiconductor material such that the hotspot alloy is in the eutectic range without bulk precipitation, because a comparison of Applicant's specification to Pepper et al.'s disclosure reveals that Pepper et al. discloses a metal matrix composite material that is apparently identical to the metal matrix composite material Applicant describes as being capable of having the function or property characterized as "tailoring the semiconductor material content and thickness of the semiconductor material such that the hotspot alloy is in the eutectic range without bulk precipitation."

Because, with regard to claim 7, it is reasonable to assume that assume that Pepper et al.'s metal matrix composite material is capable of performing the claimed function or achieving the claimed property, the burden shifts to Applicants to show that it cannot.

See MPEP § 2114. See also *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985) (Claims were directed to a titanium alloy containing 0.2-0.4% Mo and 0.6-0.9% Ni having corrosion resistance. A Russian article disclosed a titanium alloy containing 0.25% Mo and 0.75% Ni but was silent as to corrosion resistance. The Federal Circuit held that the claim was anticipated because the percentages of Mo and Ni were squarely within the claimed ranges. The court went on to say that it was immaterial what properties the alloys had or who discovered the properties because the composition is the same and thus must necessarily exhibit the properties); and *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990) (Applicant argued that the claimed composition was a pressure sensitive adhesive containing a tacky polymer while the product of the reference was hard and abrasion resistant. According to the Federal Circuit, "The Board correctly found that the virtual identity of monomers and procedures sufficed to support a prima facie case of unpatentability of Spada's polymer...").

With regard to all of claims 4-7, because Pepper clearly teaches a predictable (and clearly advantageous) result from substituting Al-Si (13% silicon) metal matrix composite material for the Al alloy of unknown composition taught by Kogo et al. it would have been obvious to a person having skill in the art to further modify the a high-power press pack semiconductor module suggested by Lang et al., Tsuruoka, and Kogo

et al. by employing a metal matrix composite material comprises an Ag or Al metallic matrix alloy with a semiconductor material with a Si content of at most 13 percent, resulting in Si content limited to not more than the semiconductor material content of an eutectic composition, as taught by Pepper et al., thus achieving the claimed invention. See *Ex parte* Smith, 83 USPQ2d at 1518, as discussed above.

***Response to Arguments***

**4.** Applicant's arguments filed 03/03/08 have been fully considered but they are not persuasive.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

***Conclusion***

**5.** Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas L. Dickey whose telephone number is 571-272-1913. The examiner can normally be reached on Monday-Thursday 8-6.

If attempts to reach the examiner by telephone are unsuccessful, please contact the examiner's supervisor, Sue A. Purvis, at 571-272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you

have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

***/Thomas L. Dickey/***
***Primary Examiner***
***Art Unit 2826***